

### REVIEW OF LITERATURE

#### 2.1. Historical background on the plant knowledge in India

Studies on the plants in India have existed since prehistoric times with reference to their uses. The earliest body of Indian scripture, the Vedas and Upanishads, Puranas, Samhitas, and Materia Medica gives some crucial indications of plants growing and their uses in this country (Dutt 1893). In the Vedas, some of the mentioned plant species are Palasa (*Butea monosperma*), Salmali (*Bombax ceiba*), Soma (*Sarcostemma acidus*), Kushta (*Saussurea costus*), Apamarga (*Achyranthes aspera*), Arka (*Calotropis gigantea*), and Hastikarna (*Ricinus communis*). Charaka Samhita (c. 800 BC) emphasizes on some botanical characters such as habit, flowers, mode of propagation, etc., and the classification of plants as medicinal, dye yielding, pulses etc. can be seen. Some of the mentioned plant species are Masura (*Lens esculenta*), Tuvara (*Cajanus cajan*) as pulses; Shala (*Shorea robusta*), Sissoo (*Dalbergia sissoo*), Paruska (*Grewia asiatica*) as timber yielding plants; Bimba (*Coccinea grandis*), Harida (*Curcuma domestica*), Pipli (*Piper longum*) as medicinal and other useful plants. Susrutha Samhita (560–480 BC) is the evidence of systematic knowledge on plants where more than 700 plants are named in 37 groups depending on the disease treated, and food plants are classified based on parts used and taste. Brihat Samhita of Varaha Mihira (c. 500 AD) listed some plants based on ecology, and as indicators of underground water. Some of the mentioned groundwater indicators plant species are Amrataki (*Spondias pinnata*), Arjuna (*Terminalia arjuna*), Bhallataka (*Semecarpus anacardium*), Jambu (*Syzygium cumini*). It is mentioned in Mihira that Kataka (*Strychnos potatorum*) can be used to clear the turbid water. Ritusamhara and Meghadoota, written by Kalidasa (c. 5<sup>th</sup> century AD) mentioned many plant names of different habits along with floral changes in seasonal variations (Nair *et al.* 1996). From the brief points mentioned above, it is evident that Indian plants have been studied in various ways since ancient times.

## 2.2. Review of botanical exploration in India

'*Species Plantarum*' by Linnaeus (1753) is the first publication on the binomial system of nomenclature, which is regarded as the starting point of modern plant nomenclature. Koenig (1728–1789), a student of Linnaeus, brought the Linnaean system of nomenclature in India. During 1768, he began to study the flora of the Madras coast. Roxburgh (1751–1851) came madras in 1776 and joined Koenig in the study of Madras coast flora (Nair *et al.* 1996). He collected and published several attractive illustrative systematic works on the Indian plants, particularly the 'Plants of the coast of Coromandel' (1795, 1798 and 1819 respectively) and 'Flora Indica: or Description of Indian Plants' (1820 and 1824) with great significance to Indian Botany. For which he was regarded as the father of Indian botany.

Wight (1798–1872) came to India in 1819, who had a massive collection of plant materials. After spending 35 years in India, he described 38 new genera and more than 3,000 species in several publications (Nair *et al.* 1996). Some of the renowned publications consulted by Botanist are 'Illustration of Indian Botany' (1831–1832, 1840 and 1850), 'Contribution to the Botany of India' (1834) and 'Icons Plantarum Indiae Orientalis' (1838–1853).

Hooker and his co-workers (1872–1897) published the ultimate seven-volume flora book 'The Flora of British India' which is the only standard reference to study the Indian flora. They recorded 14,312 species under 2,325 genera belonging to 171 families. Of these, 10,200 species under 2,073 genera belonging to 170 families were recorded from the present political boundary of India (Karthikeyan 2000).

The political area of Hooker's work changed after the end of the colonial period. Therefore, the Botanical Survey of India (BSI) decided to bring the country's flora into perfect shape under the present political boundary of India. Hence, intensive surveys, collection of specimens in different corners of the country have been done based on Hooker's flora, resulting in several publications with up to date nomenclature and new taxa. Some of the reputed publications on the Indian flora by BSI are—Fascicles of Flora of India with Fascicles 1–17 edited by Jain *et al.* (1978, 1979, 1979, 1980, 1980, 1980, 1981, 1982, 1982, 1982, 1982, 1983, 1983, 1984, 1984, 1984, 1984), Fascicle 18 edited by Nayar *et al.* (1984), Fascicles 19–20 edited by Nayar *et al.* (1988, 1990), Fascicle 21 edited by Hajra *et al.* (1995), Fascicles 22–23 edited by Hajra and Sanjappa (1996, 2006), and Fascicle 24 edited by Jagtap and Singh (1999). —Flora of India Volume 1 (Ranunculaceae–Barclayaceae) edited by

Sharma *et al.* 1993, Flora of India Volume 2 (Papaveraceae–Caryophyllaceae) edited by Sharma *et al.* (1993), Flora of India Volume 3 (Portulacaceae–Ixonanthaceae) edited by Sharma *et al.* (1993), Flora of India Volume 4 (Malpighiaceae–Dichapetalaceae) edited by Hajra *et al.* (1997), Flora of India Volume 12 (Asteraceae: Anthemideae–Heliantheae) edited by Hajra *et al.* (1995), Flora of India Volume 13 (Asteraceae: Inuleae–Vernonieae) edited by Hajra *et al.* (1995), Flora of India Volume 5 (Olacaceae–Connaraceae) edited by Singh *et al.* (2000), and Flora of India Volume 23 (Loranthaceae–Daphniphyllaceae) edited by Balakrishnan *et al.* (2012). Singh *et al.* (2019) conducted a complete analysis of the Indian orchids. They recorded a total of 307 endemic taxa to India, out of 1,256 belonging to 155 genera.

### **2.3. Review of floristic diversity in northeast India**

Northeast India is botanically the richest region in India (Nair *et al.* 1996). Based on the literature of Deb (1963), Rao (1974), Balakrishnan (1981), Rao and Verma (1982), and Nair *et al.* (1996), some of the historical floristic explorations in the regions are mentioned below—

It was the 18<sup>th</sup> century when plants were collected and studied in northeast India. Buchanan-Hamilton was the first plant collector who gathered plants systematically in the vicinity of Gauhati. In 1826, Mr. and Mrs. Mack made some collections of plant specimens from Khasi hills. During 1834–1835, Scott collected plant specimens from Khasi Hills, Mikir Hills, and Brahmaputra Valley. During 1836–1838, Griffith made extensive collections from Sadya, Mishmi and Naga hills, and the Khasi hills. He collected about 1,700 species in Assam and Meghalaya and in Arunachal Pradesh about 800 species. During 1850–1851, Hooker and Thomson made huge collections in Meghalaya, regarded as their major contribution to northeast India. During 1843–1873, Master collected from Golaghat, Nowgong, Sadya, and hills of the Angami Nagas. During 1883–1887, Clarke had surveyed Khasi hills, Golaghat, Kohima, Manipur area and made a large number of collections, which are now deposited in the Kew Herbarium with a duplicate set in the Central National Herbarium (CAL). During 1863–1881, Mann, a Conservator of Forests of Assam, made extensive collections throughout the northeast region and deposited in the ASSAM herbarium. Following Mann, Kanjilal, De, Dutta, Sharma, Purukayastha, Syam, Das and Deka, made extensive collections and explorations in the region and enriched the ASSAM herbarium.

The first systematic and floristic account of the region came into light after the publication of 'Flora of Assam' in five volumes by Kanjilal *et al.* (1934–1940). The first four volumes are deals with the dicotyledons, and the fifth volume deals with the monocot family Gramineae by Bor. Then, Rao and Verma, conducted an extensive survey of the monocotyledons groups and published several papers. They are the ones who made a detailed account of the family Cyperaceae and published 'Cyperaceae of north-east India' in 1982. Some of the recent floristic studies by several workers in northeast India are—'Flora of Nongpoh and its vicinity Kasi and Jaintia hills district, Assam' by Joseph (1968), 'Flora of Jowai and vicinity Meghalaya' by Balakrishnan (1981, 1983), 'Forest Flora of Meghalaya' by Haridasan and Rao (1985, 1987), 'Flora of Tripura State' by Deb (1981, 1983), 'A contribution to the Flora of Namdapha Arunachal Pradesh' by Chauhan *et al.* (1996), 'Flora of Manipur' edited by Singh *et al.* (2000), 'Flora of Mizoram' edited by Singh *et al.* (2002), 'Materials for the Flora of Arunachal Pradesh' Volume 1 edited by Hajra *et al.* (1996), 'Materials for the Flora of Arunachal Pradesh' Volume 2 edited by Giri *et al.* (2008), 'Materials for the Flora of Arunachal Pradesh' Volume 3 edited by Chowdhery *et al.* (2009).

#### **2.4. Review of floristic diversity in Assam**

A brief floristic study conducted by many researchers in different parts of Assam are indicated below—

Baruah (1978) studied the orchid diversity of the Brahmaputra Valley recorded 115 species and 4 varieties under 50 genera. Singh (1993) made a systematic study on the dicotyledonous plants in Lakhimpur district. He recorded 947 species under 526 genera of 144 families. Devi (1998) studied the herbaceous flora of Angiosperms in Tezpur sub-division of Sonitpur district and recorded a total of 463 species, where dicotyledons comprise of 324 species and 139 species were monocotyledons. Nath (1999) explored the floristic diversity of the Orang Wildlife Sanctuary. He reported 447 species under 339 genera of 110 families. Gogoi (2006) conducted a survey on the macrophytic diversity of Deepar Beel with seasonal variations. He reported a total of 435 species under 305 genera of 103 families of Angiosperm where dicots comprise 294 species under 224 genera of 82 families and monocots comprise of 141 species under 81 genera in 21 families. Nath (2006) studied the dicot flora of Goalpara district and recorded a total of 427 species under 301 genera belonging to 96 families. Sarmah (2006) made a study on the angiospermic flora of Barpeta district. He recorded a total of 787 taxa

under 460 genera belonging to 134 families, where dicots comprised 587 taxa under 352 genera belonging to 106 families and monocot comprised 200 species under 108 genera of 28 families. Borah (2008) made a complete survey on the flora of Bongaigaon district and recorded a total of 672 species of angiosperm comprising dicot 489 species under 327 genera belonging to 105 families and monocot 183 species under 130 genera belonging to 32 families. Daimary (2011) conducted a floristic survey of Kokrajhar district with special reference to Chakrashila Wildlife Sanctuary and recorded a total of 823 species including Pteridophytes, Gymnosperms and Angiosperms. In angiosperm, he recorded 789 species under 490 genera belonging to 137 families. Baruah (2013) studied the herbaceous flora of Cachar district and recorded 537 species, including 290 species of dicots, 191 species of monocots and 56 species of Pteridophyte. Saikia (2013) studied the floristic composition of the Poba Reserve Forest. He recorded 882 taxa including 663 species of dicots and 219 species of monocots. Deka (2015) worked on the aquatic Angiosperm of Bodoland region and recorded 300 species under 194 genera belonging to 77 families. Of these, 180 species are dicot and 120 species are monocot. Boro (2016) explored on the floristic diversity of Udalguri district. He recorded a total of 707 taxa. Of these, dicots comprise of 569 species under 400 genera belonging to 123 families and monocots comprise of 138 species under 104 genera belonging to 25 families. Haque (2016) worked on the aquatic flora of Goalpara recording a total of 196 species under 137 genera belonging to 58 families. Pagag (2016) worked on the wetlands of Lakhimpur for aquatic plant where 237 taxa have been recorded under 162 genera belonging to 76 families. Baro (2017) worked on the floristic diversity of Baksa district and documented 661 species under 486 genera belonging to 170 families. Of these, 625 species under 458 genera of 147 families are Angiosperms, 33 species are Pteridophyte and 3 species are belonging to Gymnosperm. Gogoi (2017) made a complete enumeration of the wild orchids of Assam. He recorded a total of 406 taxa belong to 101 genera. Borthakur *et al.* (2018) worked on the floristic diversity of Bodoland Territorial Region. They documented 1,479 species including Pteridophytes, Gymnosperms and Angiosperms. Of these, Angiosperms comprise 1385 species under 712 genera belonging to 167 families, 88 species of Pteridophytes, and 6 species of Gymnosperms. Phangchopi (2018) worked on the flora of Marat Longri Wildlife Sanctuary in Karbi Anglong, documenting a total of 359 species of flowering plants under 257 genera belonging to 86 families. Teronpi (2018) worked on the floristic composition of Singhason Peak and the adjacent hills of Karbi Anglong, documenting 340 species under 263 genera belonging to 95 families. Narah (2019)

made a survey on the Angiosperm diversity of Demaji district, documenting 690 species under 419 genera belonging to 120 families. Of these, dicots comprise 580 species and monocots comprise 110 species. Mipun (2020) worked on the Angiosperm diversity of East Karbi Anglong. He documented 546 species in 357 genera belonging to 115 families. Out of these, dicots comprise of 451 species under 290 genera belonging to 90 families and monocots comprise of 95 species under 69 genera belonging to 25 families.